REMARKS

This AMENDMENT UNDER 37 CFR 1.116 is filed in reply to the outstanding Office Action of July 8, 2004, and is believed to be fully responsive thereto and to place this case in condition for allowance for reasons set forth below in greater detail. Accordingly, entry of this AMENDMENT UNDER 37 CFR 1.116 is respectfully requested.

Initially, it is noted that claim 1 is considered generic to all disclosed species, and accordingly if claim 1 is found to be allowable, withdrawn claims 4-6 and 13-15 should be allowable therewith.

Reconsideration is respectfully requested of the rejection of claims 1-3, 7 and 9-12 under 35 USC 103 over Delpech et al, particularly in view of the distinguishing and clarifying amendments to claim 1 and the following comments on the distinctions and advantages of the present invention over Delpech et al.

Initially, with respect to the prior art rejection, the Examiner has stated "Delpech et al. do not teach the two minimum design width end portions and the sub-minimum width link portion are produced simultaneously in one photolithographic operation. However, this is a product-by-process limitation. The process limitations are given no patentable weight in device claim. The final structure of claimed invention is identical to the Delpech's device."

The present invention and Delpech employ substantially different photolithographic approaches to produce a subminimum width link, with other circuit elements all having a minimum design width produced by the photolithographic process, that establishes the density of all fuses.

The present invention provides a superior fuse relative to Delpech, providing improvements in fuse density, reproducibility and control over the sub-

minimum region as compared to Delpech, both in the width and length dimensions of the subminimum width link, as well as the relative registration of the subminimum width link within the fuse neck.

Moreover, it should be pointed out that a limitation imposed by Delpech, which is also present in Delpech claim 1, is the utilization of "at least one dummy element having a spacing from said at least one second portion for providing an optical proximity effect during processing so that the second width is less than the first width".

Referring to Figures 7 and 8 of Delpech, the center portion of the fuse has a width DW1 in Figure 7, which is the minimum design width in Delpech, and the photolithographically produced dummy elements D22 and D23 are separated from the center portion by spacings DE3, which are approximately equal to the minimum design width DW1. Moreover, the spacings DE3 are not larger because otherwise the dummy elements D22 and D23 would not provide their desired proximity effects to create the subminimum width W1=WMIN link portion shown in Figure 8.

Statement of Delpech Limitations:

1) Delpech requires the registration of at least one dummy element 22, 23, and preferably two dummy elements 22, 23, in relation to the length L of the fuse in his Figure 3, so as to minimize the variation in R3 and Ra2.

2) In order for Delpech to create the jogs of the fuse element 4 (for example in his Figure 8), the dummy elements 22, 23 must contain non-orthogonal edges as shown in Figure 8. Structures having such edges are known in the art to produce significant non-systematic offsets in the proximity created shape of the fuse element 4, due to the inherent inability to resolve such shapes photolithographically. This provides unwanted substantial variations in both the width WMIN and the length of a WMIN feature.

Delpech in his best mode uses two dummy elements 22, 23, one on either side of the fuse 4 in Figure 8, to produce a sub-minimum link WMIN. This compounds the situation described above in 2), which in the best mode has two jogs imaged in fuse 4, both having non-systematic errors. In addition the best mode of Delpech fuses uses three minimum images, images of the fuse 4, dummy element 22 and dummy element 23, for each fuse, thus decreasing the packing density of repeated fuse elements.

Moreover, such added dummy elements inadvertently create a thermal path to the substrate and subsequently can hinder the final programming of the fuse 4.

Statements of the superior structure and design of the present invention that teach away from the Delpech limitations above, numerically referenced to the above Statements of Delpech Limitations.

1) The length of the minimum width feature of the present invention is fixed by the original placement of the fuse jog and or space, and is not subject to a registration error of a neighboring dummy element to the "active" fuse shape.

2) The minimum image of the present invention is created by recognizing a sub-minimum space or jog (all of which are orthogonal shapes) in an otherwise continuous image bridging the two images with a third repeatable sub-minimum feature. The present invention does not suffer from the edge translation of Delpech. As such, our fuse neck length can be of a minimum dimension as we do not have to incorporate the translation tolerance into the design of this fuse. Delpech must account for this, which may result in fuses that cannot be programmed when the non-systematic error translates into elements that when printed do not create a Wmin.

3) The present invention requires only one image per fuse, thus our fuse is by default able to be denser than Delpech's. It is apparent that the present invention has a density advantage over Delpech.

4) Delpech's having one or two dummy elements per fuse also imposes two other deficiencies.

   a) Delpech must deal with the thermal leakage into the dummy elements, and provide a programming power to overcome this limitation. This limitation may result in inefficient programming of an intended fuse element (i.e. more power and/or more time are required), and also in unwanted programming of neighboring fuses due to the self heating of the dummy elements that will translate to neighboring fuses.
   b) Additionally, these dummy elements are subject to charging (as shown they are not contacted, if they were contacted Delpech's fuse density would further degrade). Such charging can unintentionally and uncontrolledly effect the programming of the active fuse elements.

Claim 1 now has the added limitation that said center portion is isolated and spaced from immediately adjacent photolithography produced features on said semiconductor substrate, other than said two end portions, by a spacing equal to at least twice said minimum design width.

The new limitation to claim 1 is clearly disclosed and supported in the drawings wherein Figures 6 and 7 (Figure 7 was the species elected for prosecution herein) clearly illustrate the new limitation of claim 1.

This limitation distinguishes over the photolithographic circuit and dummy elements D22 and D23 of Delpech which are not spaced from the center portion by a spacing equal to at least twice the minimum design width. Accordingly, claim 1 now clearly defines over Delpech.

In summary, independent claim 1 has been amended to distinguish over the presence (and also the presence of all of the disadvantages noted in detail above) of the dummy elements 22 and 23 of Delpech.

This application is now believed to be in condition for allowance, and a Notice of Allowance is respectfully requested. If the Examiner believes a telephone conference might expedite prosecution of this case, it is respectfully requested that he call applicant's attorney at (516) 742-4343.

Respectfully submitted,

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